

NASA Langley Research Center



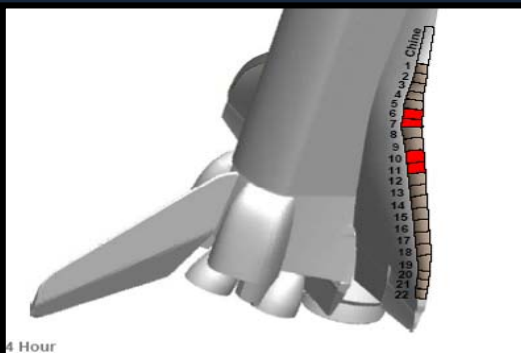
Exploration



MISSE



Wing Leading Edge Impact Detection



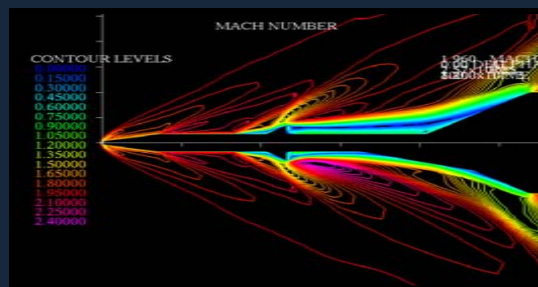
Mission Management Support



Flight Test Articles



Ares I Aero Characterization



Launch Abort System



Landing Systems



Lunar & Mars Architectures



Habitat Structures & Materials



Science



Mission Concepts



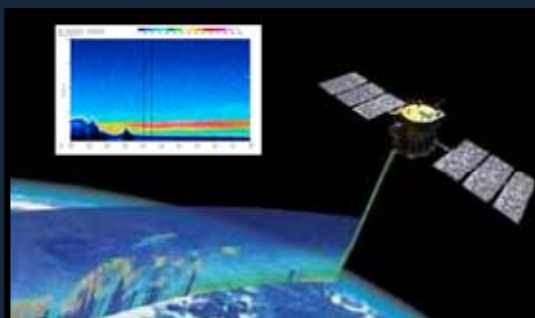
Advanced Instruments



Space-based Missions



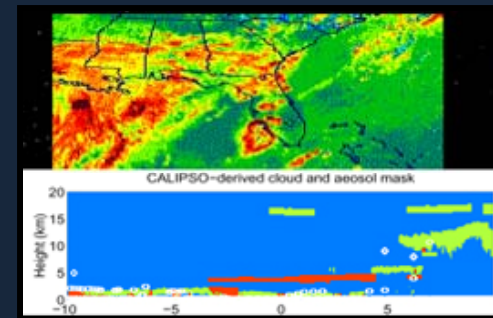
CALIPSO



A-Train



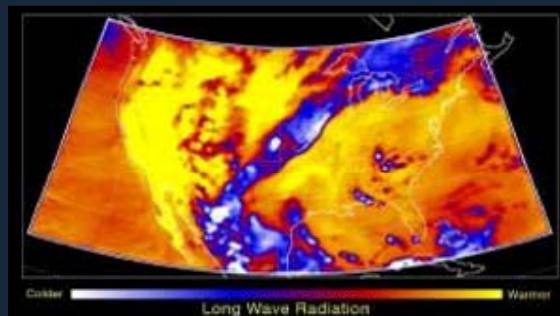
Algorithm Development



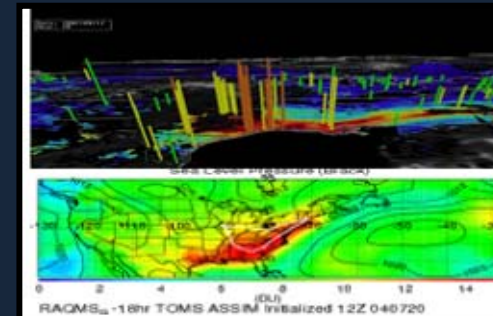
Field Missions



CERES - Radiation



Applications - Air Quality



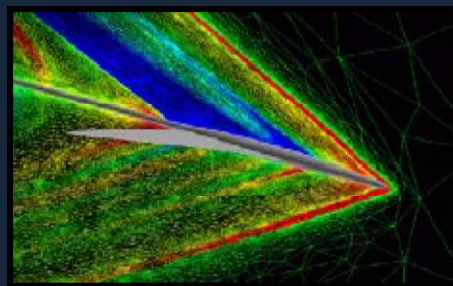
Aeronautics



Hypersonics



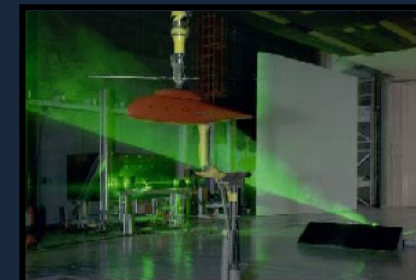
Supersonics



Fixed-Wing



Rotary-Wing



Integrated Vehicle Health Management



Integrated Intelligent Flight Deck



Aircraft Aging and Durability



Integrated Resilient Aircraft Control



Airportal





Airspace




Test Facilities





NASA and Jamestown The Road to Discovery



Exploration
1607



Exploration
2007



YAMES
TOWNE

Exploring ... the past.
Discovering ... the future.
Understanding ... the journey.

051507

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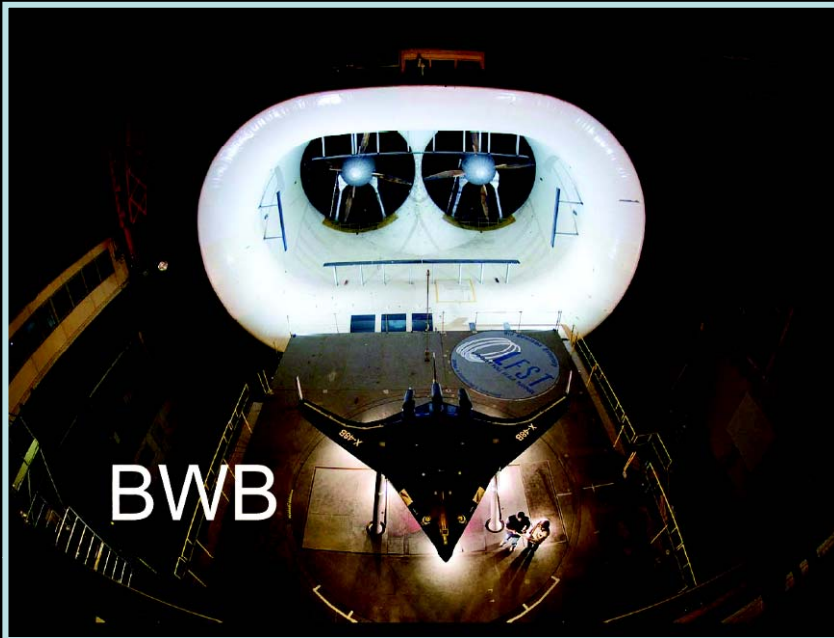


NASA Langley
IPCC Report Authors Share in
Nobel Peace Prize



CALIPSO

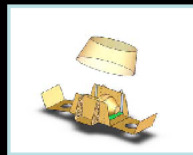




The 2007 Robert J. Collier Trophy



Hy-BoLT/SOAREX/ALV-X1



Speedo



A Problem...

A World Record Solution





Polyimide Foam Insulation

NASA 2007 Commercial Invention of the Year



LN2 Plant Construction



VASTS

Virginia Aerospace Science and Technology Scholars

On-line Discussions

Lessons

Mentoring

On-Site Activities

Science Elective Credit

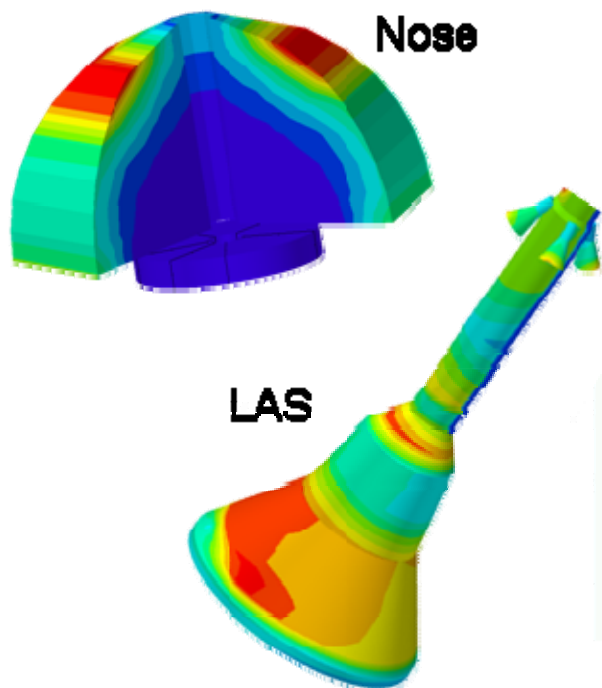
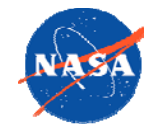
Projects



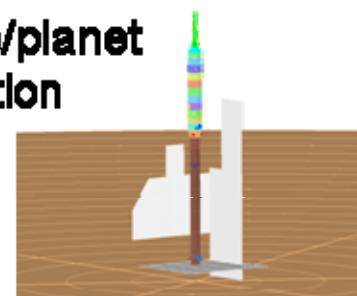


Ares I-X Thermal

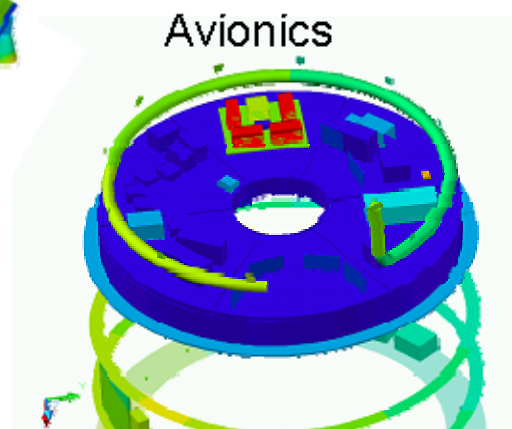
Ruth Amundsen 2008



Vehicle/planet
Interaction



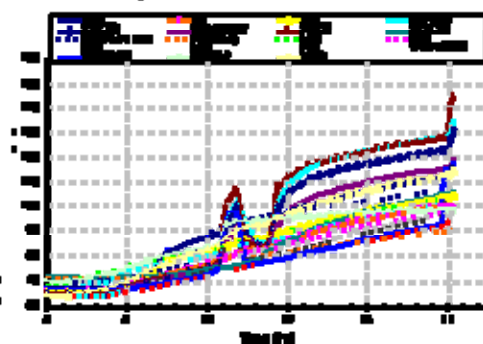
Avionics



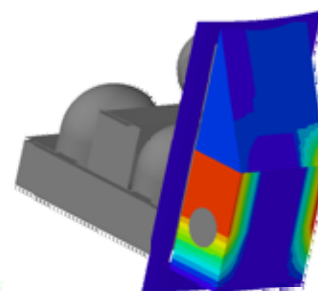
RoCS plume
on USS



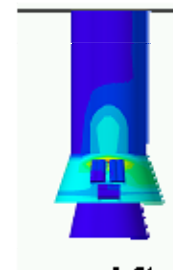
Example transients



Ares I-X launch:
April 15, 2009



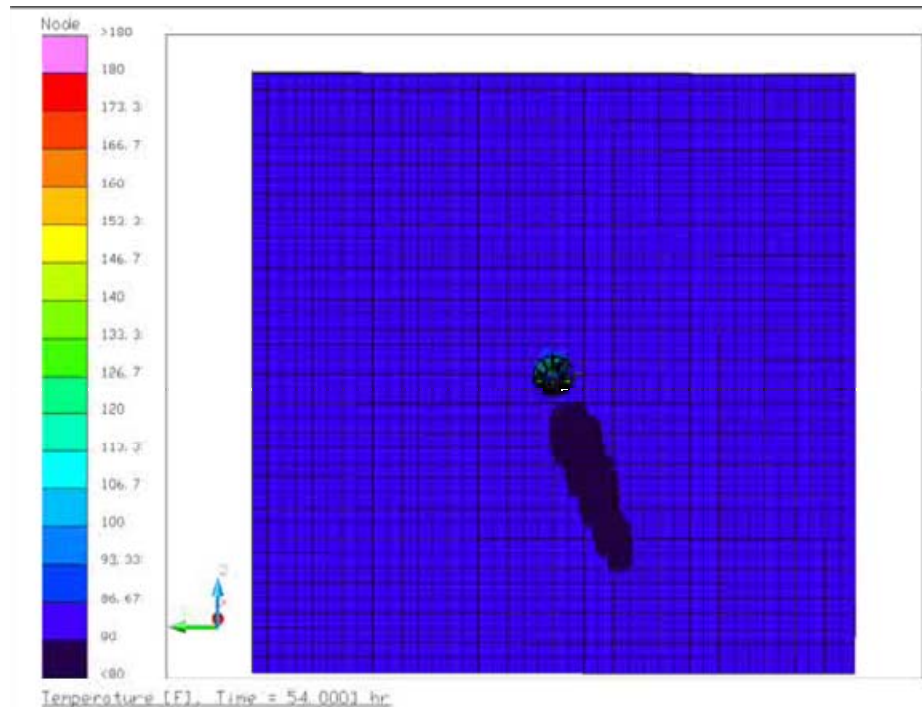
RoCS plume



Aft skirt

Orion Flight Test

Joe Gasbarre, Joe Del Corso 2008



Video of PA-1 Test Article showing diurnal shadow contours (6 AM – 7 PM LST)

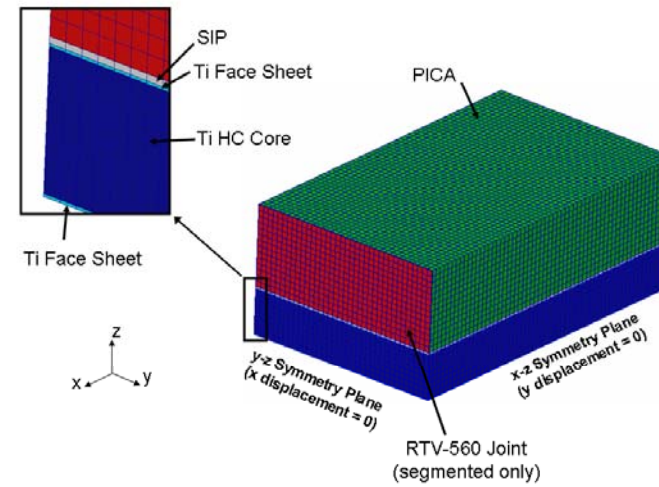
- ◆ LaRC has thermal lead for Orion flight tests (PA-1/2, AA-1/2/3)
- ◆ Tests to be done at White Sands Missile Range (WSMR), NM
- ◆ PA-1 test schedule for Spring 2009
- ◆ AA-1 test scheduled for Spring 2010

PICA Thermal Testing

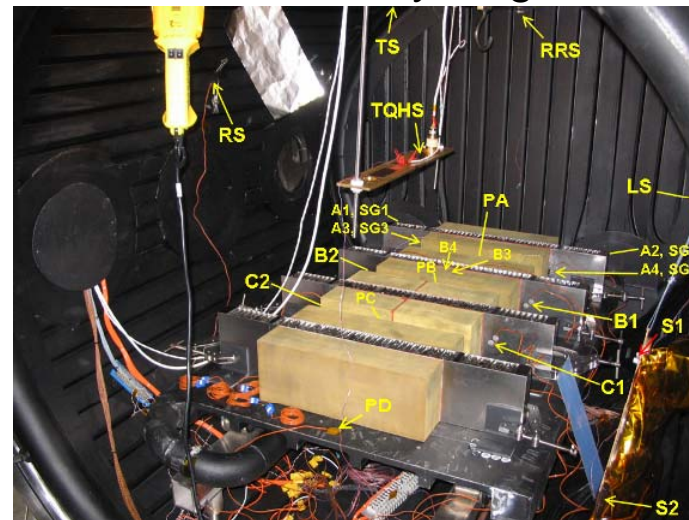
Salvatore Scola 2008



PICA Transient Thermal Test



PICA Vacuum Cycling Test



MEDLI Pressure Port Arc Jet Test

Walt Bruce, Kaitlin Liles 2008

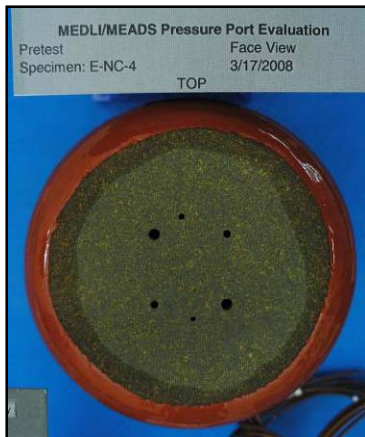
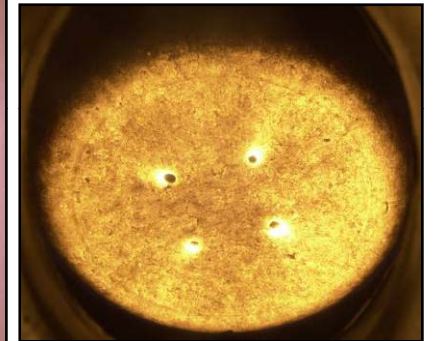
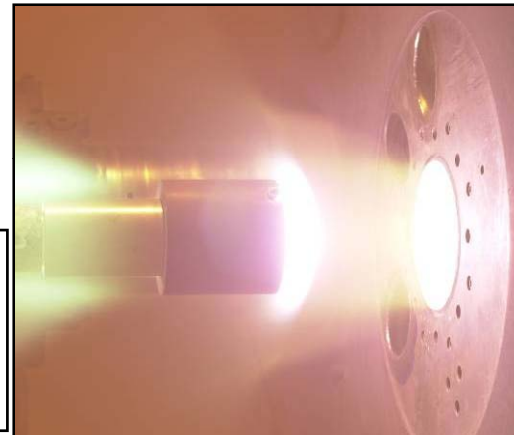


PICA Models Fabricated at Langley

- Quantity = 44
- Four active pressure measurements
- Eight temperature measurements

Tested at Boeing LCAT Facility (St. Louis)

- March 8 – 21, 2008
- Tested 34 models in 13 runs
- Test conditions match predicted flight conditions

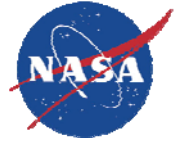


Results

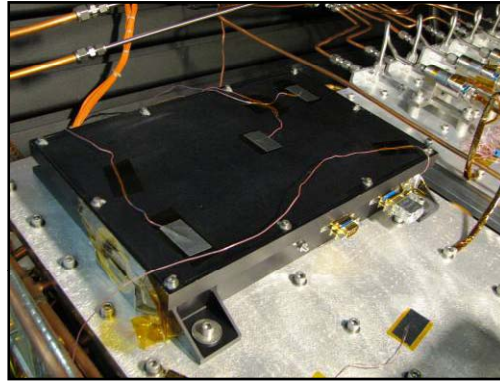
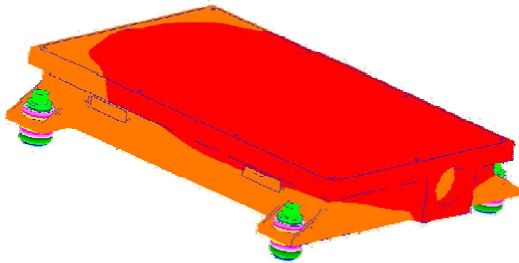
- Pressure port shape change (enlargement) greater than anticipated
- Cause identified as material oxidation phenomena
- Use of smaller port diameter being considered to stay under a maximum hole growth diameter - Science team evaluating potential impact if any
- Hole oxidation barriers (material liners) investigated during test with success

MEDLI Thermal Vacuum Testing

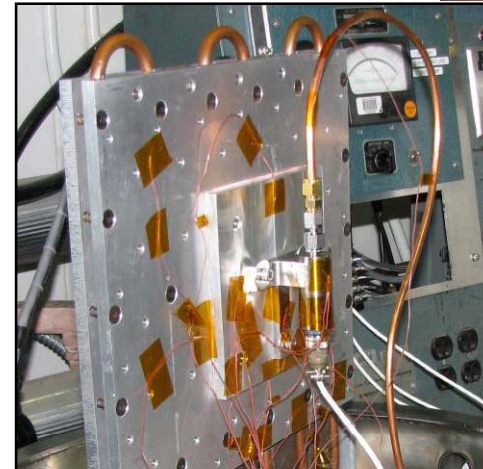
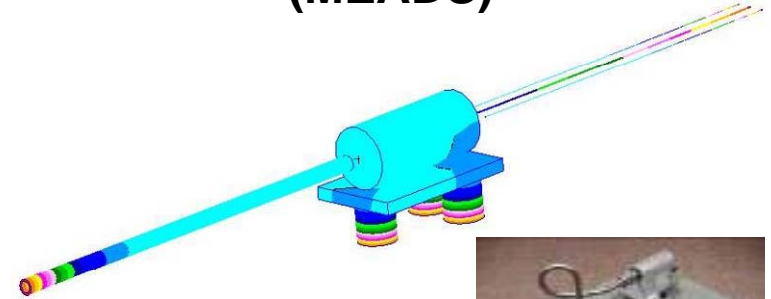
Kaitlin Liles, Walt Bruce 2008



Sensor Support Electronics (SSE)

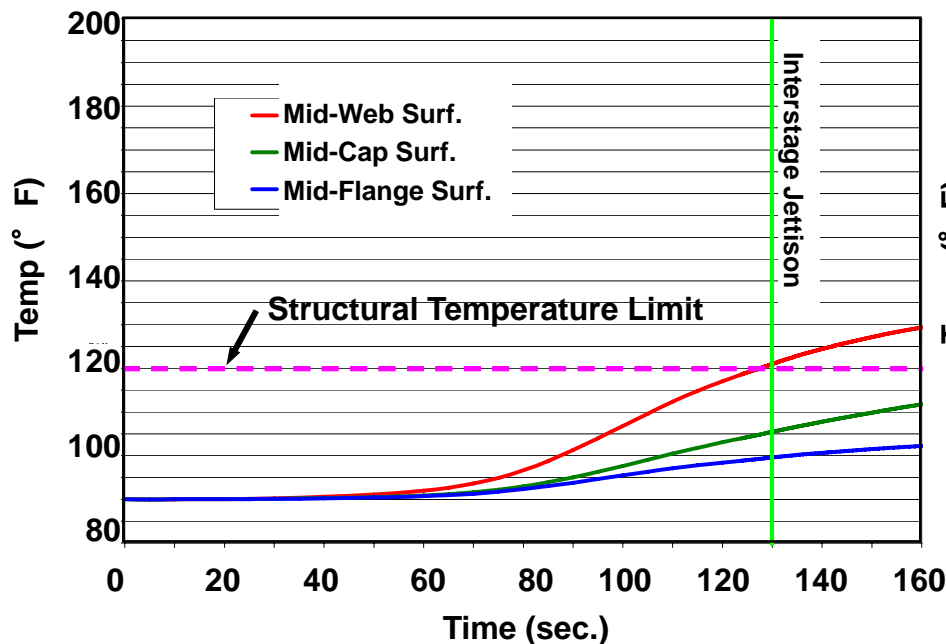


Mars Entry Atmospheric Data System (MEADS)

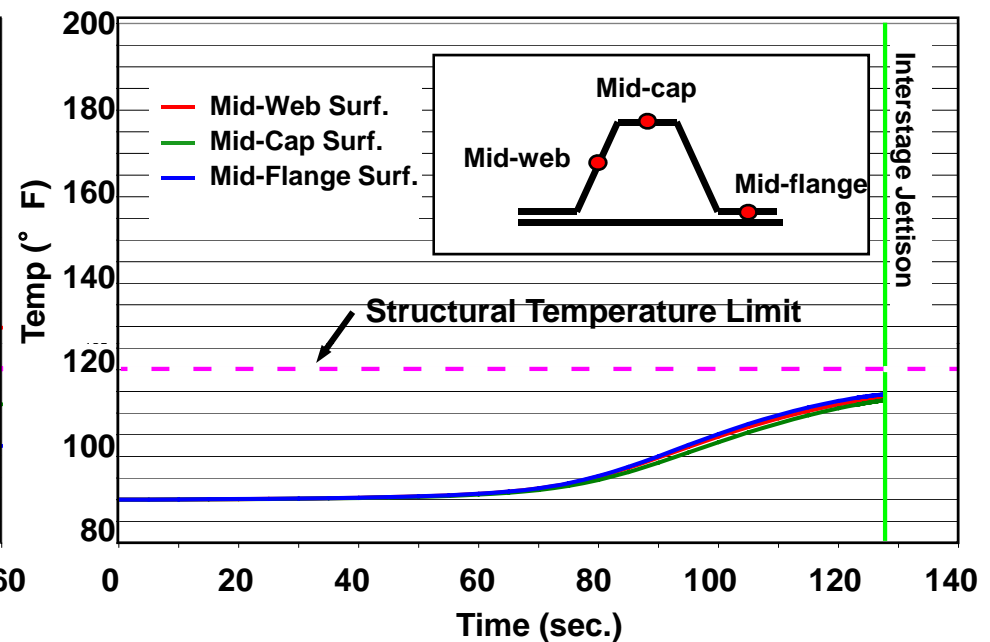


Interstage Thermal Protection System Sizing

Joe Gasbarre 2007



0.75 in TPS

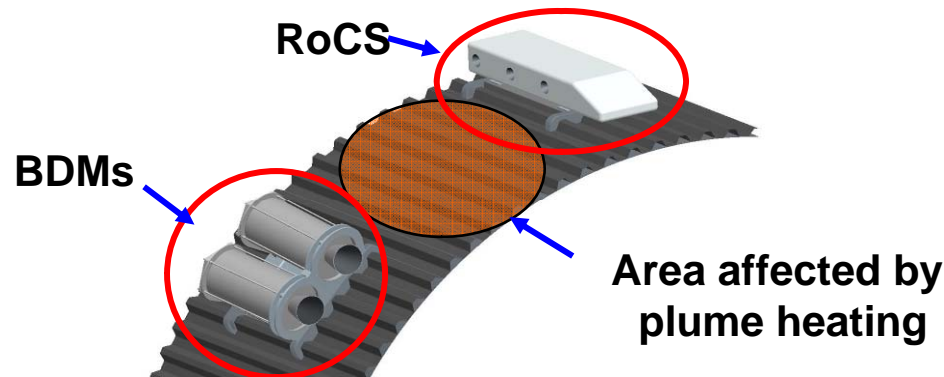
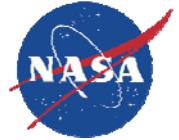


Foam-filled Hat-Stiffeners - 0.25 in TPS

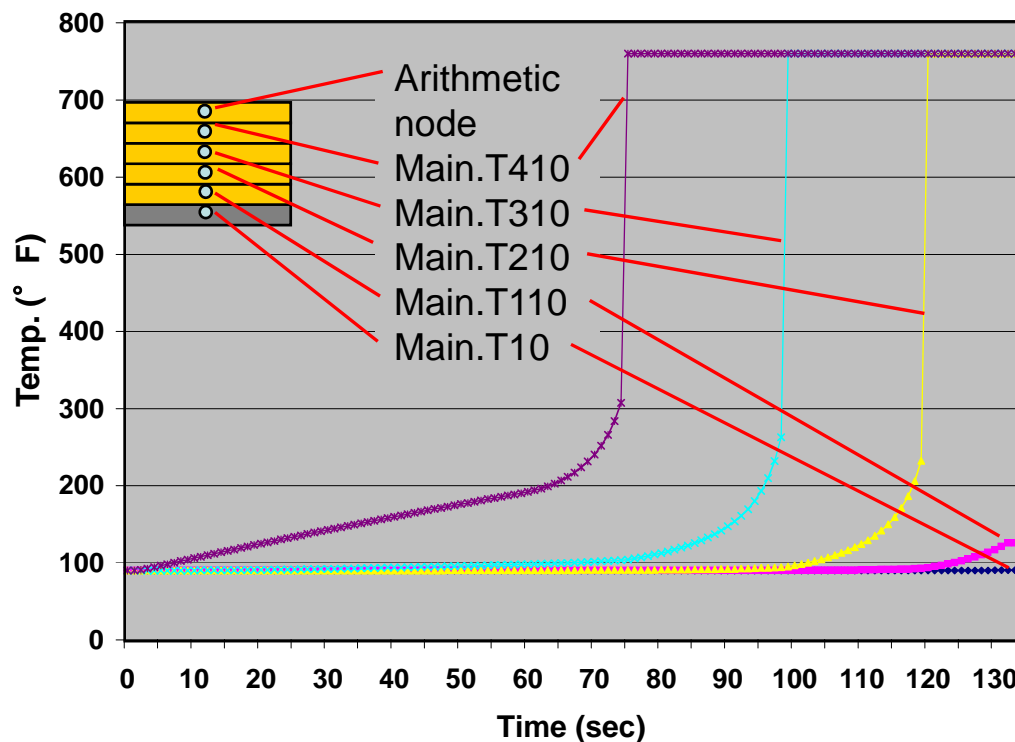
- ◆ A thickness of 0.75 in of TPS is required for the DAC-2 thermal loads with a heating amplification factor 1.17 for stringers in the flow
- ◆ Increasing the thickness of the stringer web decreased TPS thickness
- ◆ Rohacell filled hat-sections adds approximately a total of 50 lbm

Interstage RoCS Plume Shielding Sizing Results

Mark Thornblom 2007

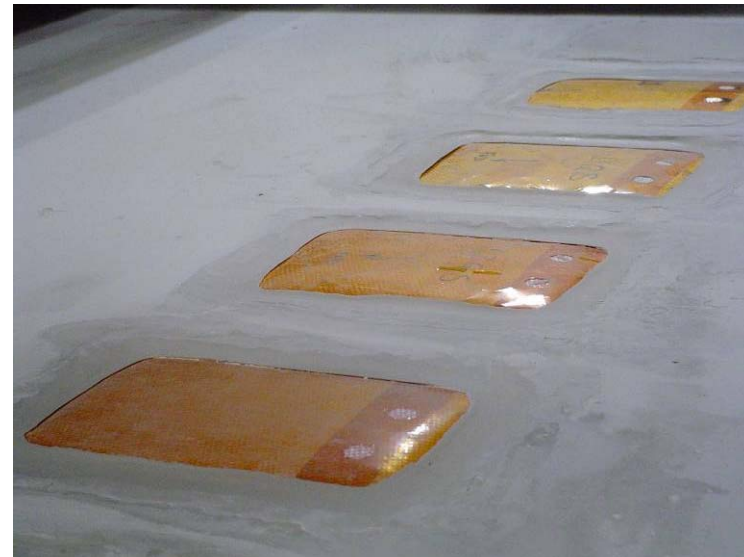
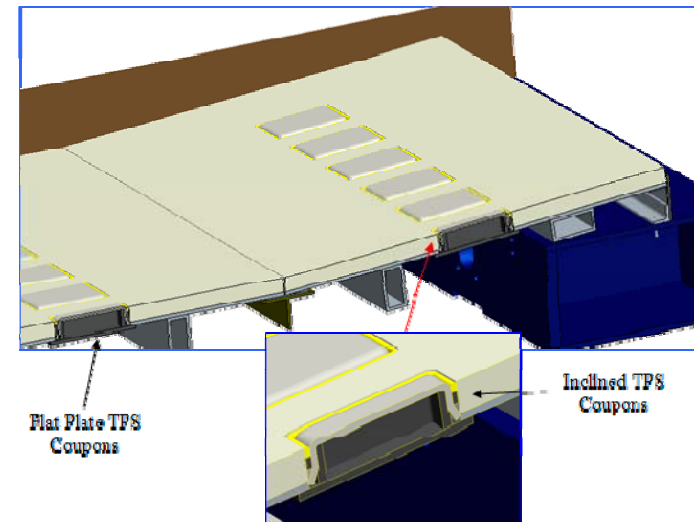
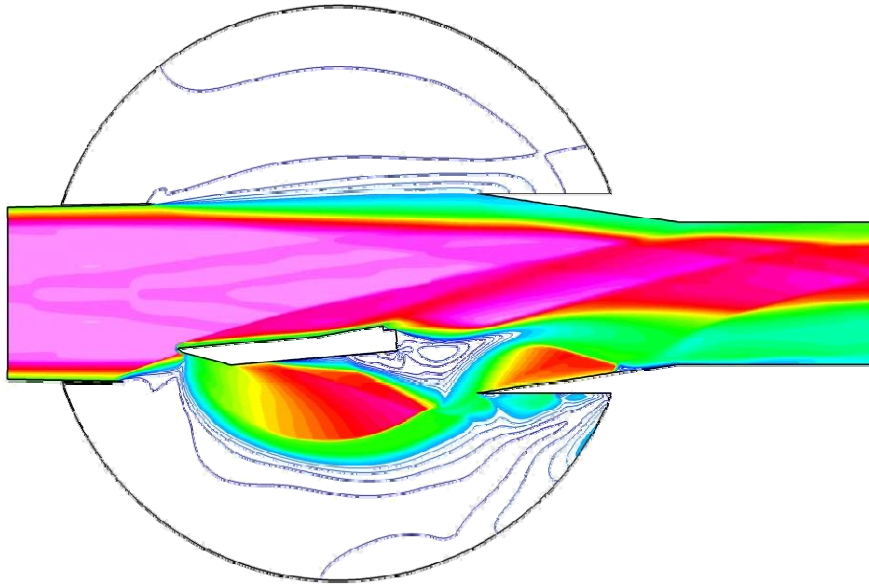


- ◆ Initial RoCS plume shielding analysis was performed
- ◆ Near 'worst-case' heating requires 1.0 in of P-50 cork to protect substrate from excessive heating
- ◆ Low conductivity materials are desired to prevent excessive temperature ($<120^{\circ}$ F) at the substrate



Program to Advance Inflatable-Decelerators for Atmospheric Entry (PAIDAE)

Joe Del Corso, Walt Bruce, Kaitlin Liles 2008

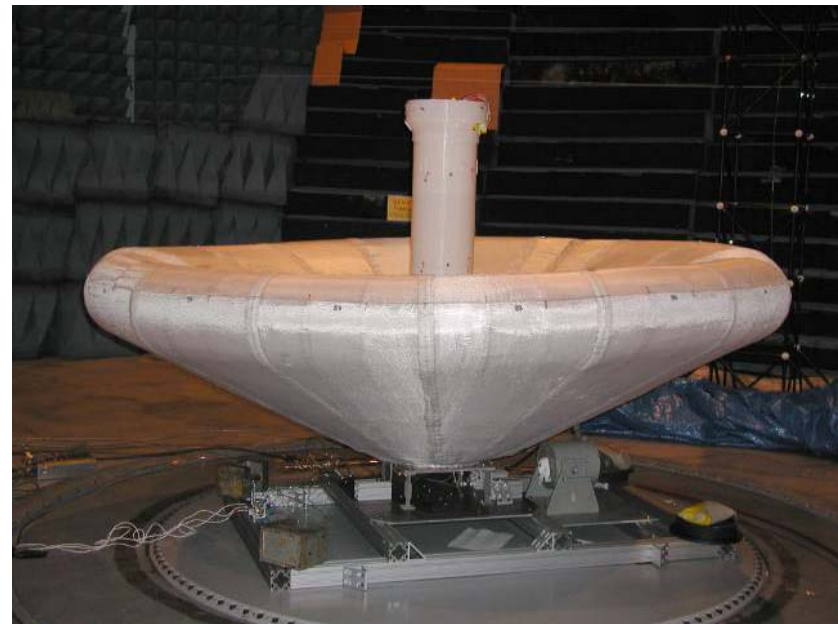
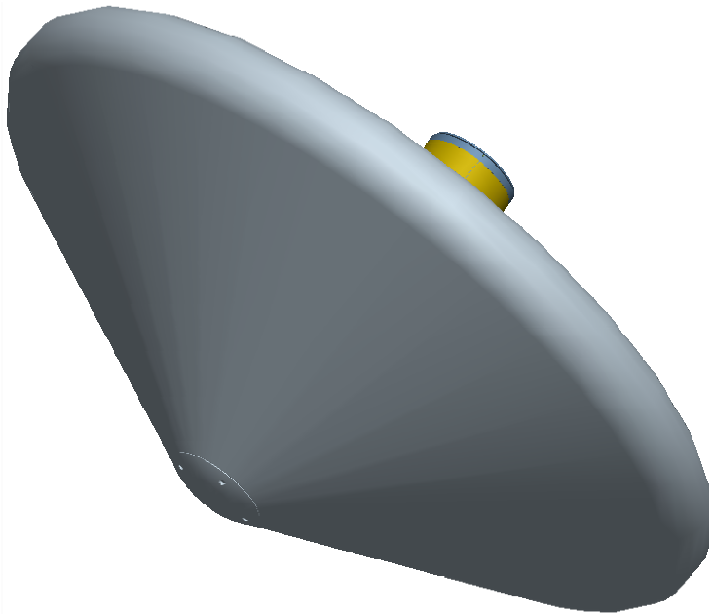
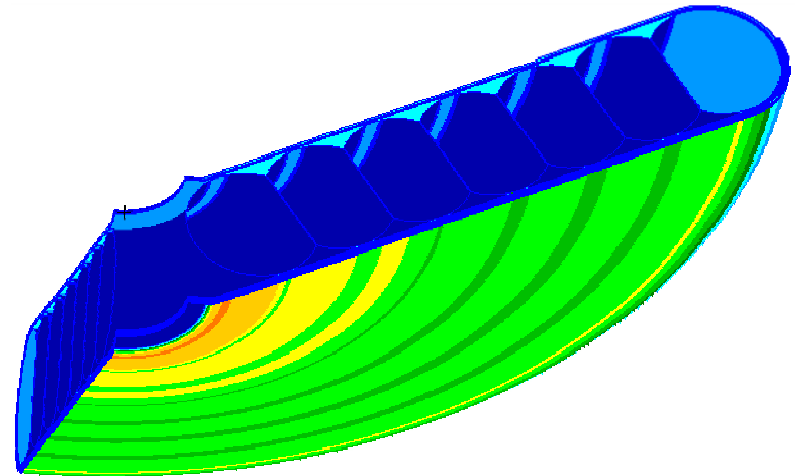


Inflatable Reentry Vehicle Experiment (IRVE I & II)

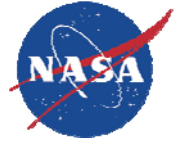
Walt Bruce, Joe Del Corso 2008



- Flight test demonstration of inflatable ballute concept
- Designed, analyzed, integrated, and tested by NASA Langley
- Aeroshell fabricated by ILC Dover
- Centerbody fabricated by NASA Langley

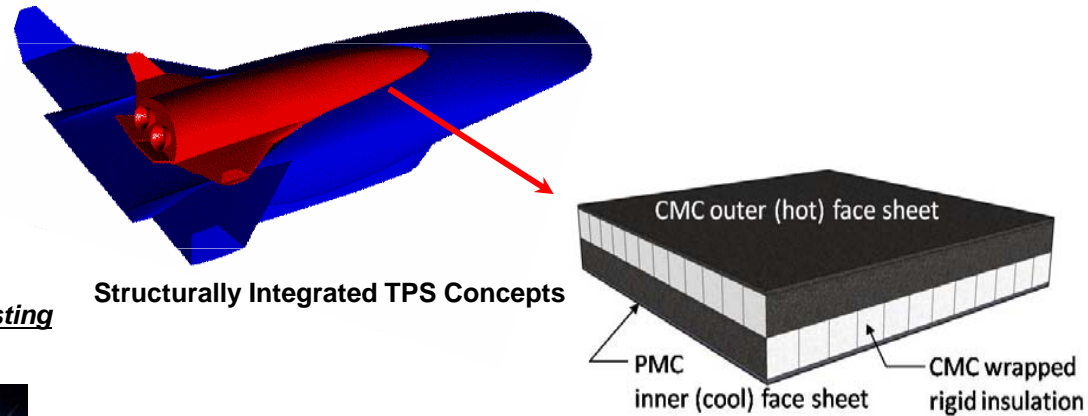


RTD/Structures Mechanics Concepts Branch Thermal Analysis & Test Highlights

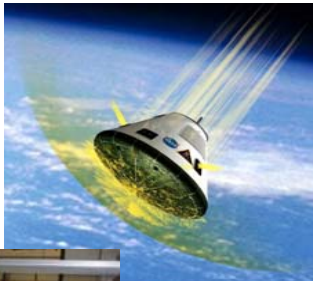


Hypersonics Project, Fundamental Aeronautics Program
POC: Dr. Kim Bey

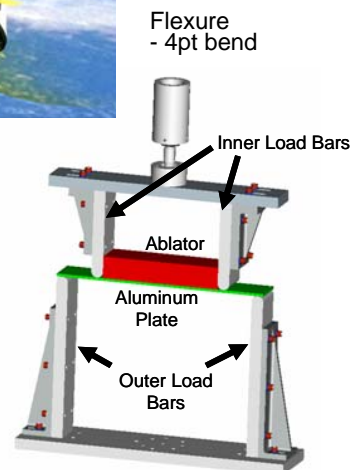
TPS Application: Highly Reliable Reusable Launch Systems (HRRLS)



CEV TPS ADP Thermal Structures Testing
POC: Dr. Max Blosser

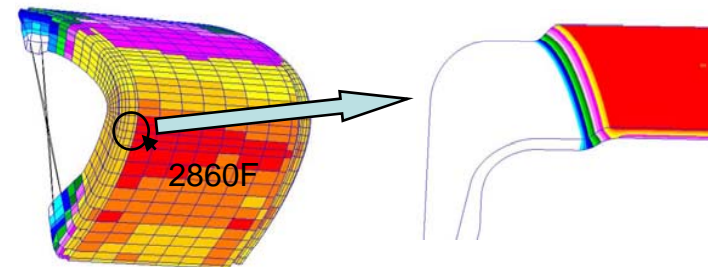


Thermal Environmental Chamber
– Elevated/Cryogenic



Entry Thermal Gradients on Shuttle Wing Leading Edge RCC Panel
POC: Dr. Sandra Walker

Boeing Global Shell Model LaRC Joggle Region Local 3D Model



Root Cause Investigation - SiC Coating Liberation in Joggle